Overview of Economic Valuation Techniques for Natural Capital Accounting: the Case of Water Sector

Economic Benefits of Water Resource

Water resource (i.e., water, water bodies, and water systems) provides economic goods (fresh water, fish) and services (recreation, fishing, waste water assimilation) which produce benefits to human being.

Water as an economic good

A commodity has an economic value when people are *willing to pay* for it, rather than go without

Water is an essential commodity, so the value of a small/basic amount for survival is infinite—people would pay *any* price.

This is not useful information for policymakers.

But *after basic needs are met*, people buy water based on its price compared to other goods they might buy.

- **Water's value is the willingness to pay for water**
- **It is observed when people make a choice between different products**

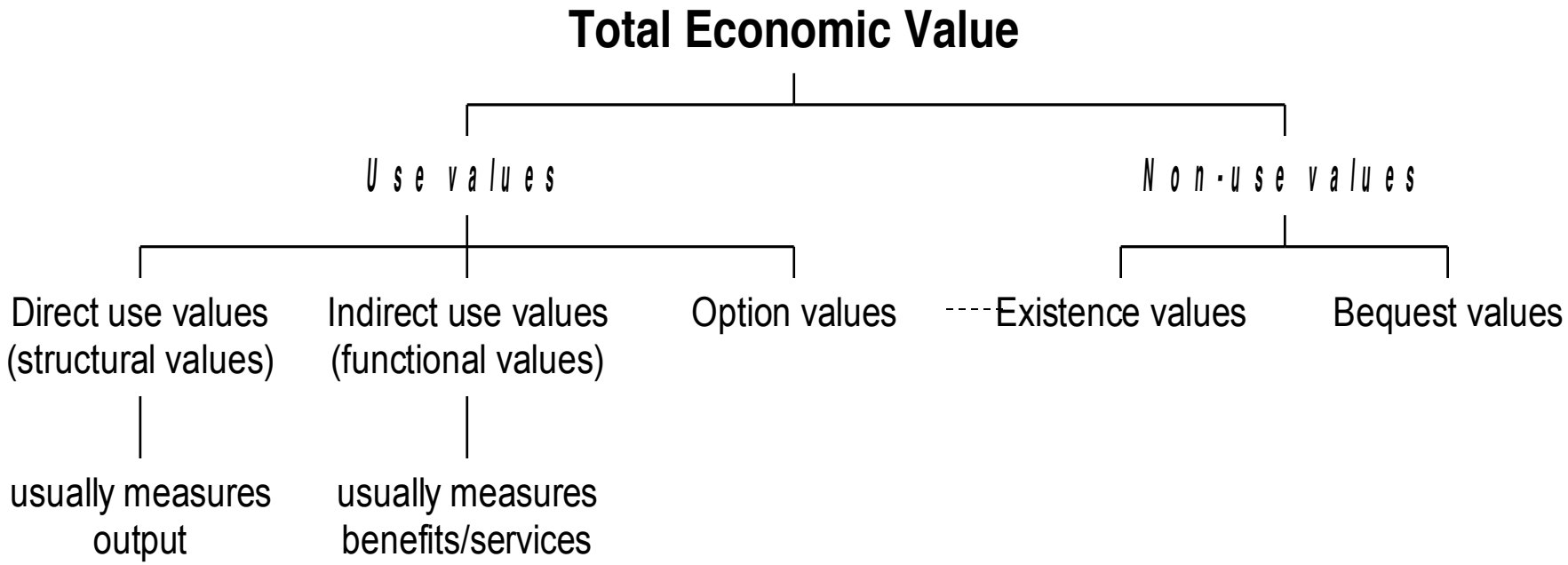
Why value water?

After basic needs are met, water should be allocated to the highest value uses.

Water value provides critical information for decisions about

- Efficient and equitable allocation of water among competing users, both
  - within the present generation
  - between present and future generation
- Efficient and equitable infrastructure investment in the water sector (how much, where, when)
- Efficient degree of treatment of wastewater
- Design of economic instruments: water pricing, property rights, tradable water rights' markets, taxes on water depletion and pollution, etc.

The Concept of Total Economic Value (TEV)



Water Valuation Techniques

1. REVEALED PREFERENCE TECHNIQUES
(based on observed market values)

Residual value

Marginal contribution of water to output, measured by subtracting all other costs from revenue

Production function approach

Marginal contribution measured as the change in output from a unit increase in water input in a given sector

Optimization models and programming

Marginal contribution measured as the change in sectoral output from reallocation of water across the entire economy

Water Valuation Techniques

1. REVEALED PREFERENCE TECHNIQUES (cont)

Hedonic pricing

Price differential paid for land with water resources

Opportunity Cost

Price differential for alternative (example: replacing hydroelectric power with coal-fired electricity

Water Valuation Techniques

2. STATED PREFERENCE
(based on surveys of willingness to pay)

Contingent Valuation Method

Survey of users, especially household water use and recreational services

Methods for Valuing Water's Waste Assimilation Services

Waste assimilation services can be valued in 2 ways

- **Pollution damages avoided**

  This approach asks, 'What would be the cost of damages (to health, production activities) that would occur if we didn't have this waste assimilation service?'

- **Costs of preventing damage**

  Value is measured as the costs of measures to prevent pollution: water treatment technologies, pollution abatement technologies, purchase of alternative goods (bottled water)

Most commonly used water valuation techniques

	Frequency of water valuation studies	Most common methods used
Agriculture	Most common application	Residual value (and variations)
		Production function
		Programming models
Manufacturing	Uncommon	Production function, programming
Hydroelectric power	Common	Programming models, opportunity cost
Consumer good	Common	CVM, programming models
Waste assimilation services	Common	Cost of prevention, Benefits from damages averted

Residual Value (Value Marginal Product)

The easiest & most commonly applied valuation technique

$$TVP = \sum p_i q_i + p_w q_w$$

$$p_w = \frac{TVP - \sum p_i q_i}{q_w}$$

where

TVP = Total Value of the commodity Produced

$p_i q_i$ = the opportunity costs of non-water inputs to production

p_w = value of water (its marginal product)

q_w = the cubic meters of water used in production

Non-water inputs include:

intermediate inputs, labor, capital costs, land

Approach Water Valuation Cautiously!

Value consistent with SNA: include all values but indicate type of value and robustness

Accuracy/uncertainty: start with major uses that are easiest to value (agriculture) & indicate range of values

Aggregation: implement valuation at local/river basin level

Asset value: begin with water bodies with single or few uses that can be easily valued

Thank you!

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